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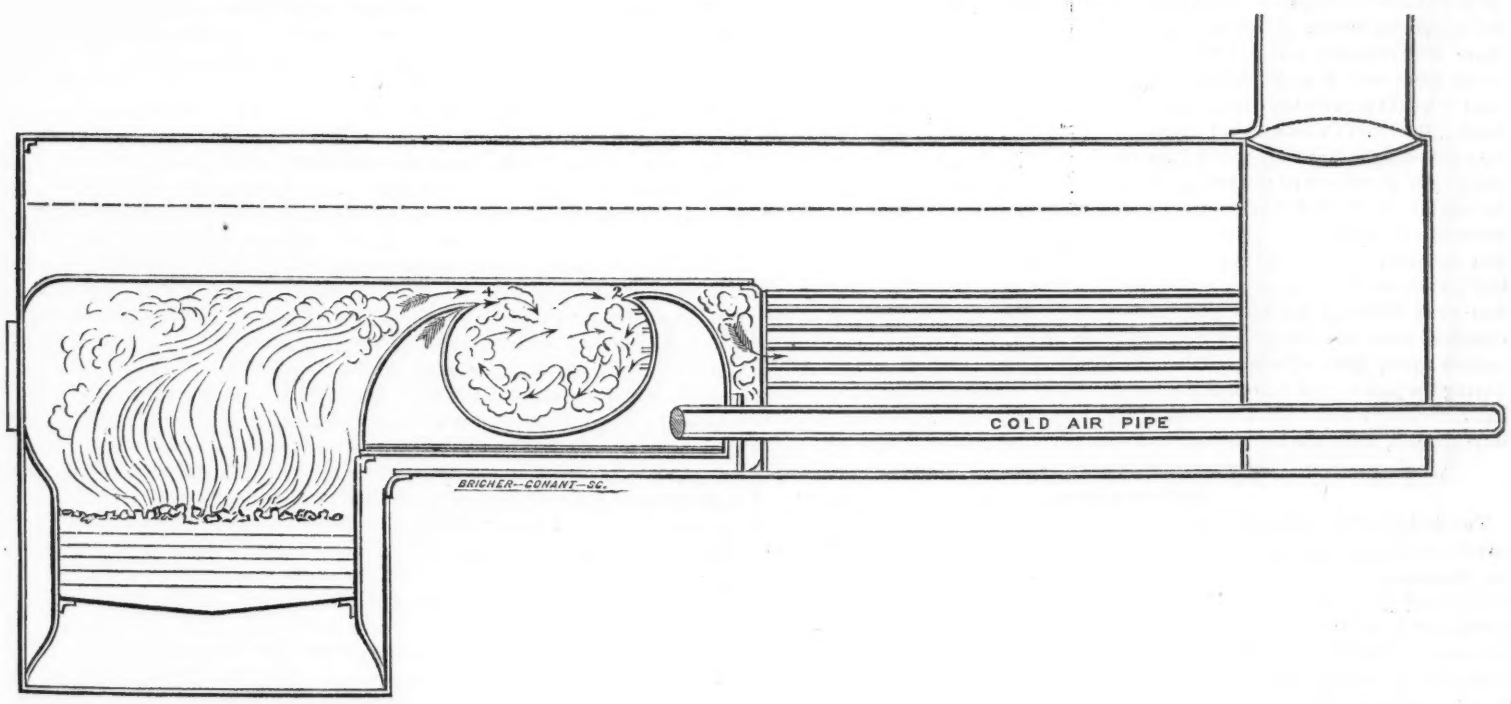
Amory's Mode of Burning Fuel.

IN the JOURNAL of April 16, 1872, we described the method of burning fuel, patented by Mr. JONATHAN AMORY, 70 Washington street, Boston. He places between the grate and the surface to be heated a chamber in which the products of combustion are fully burned by a second supply of air. These products are both gaseous and solid, the latter consisting of the finely divided soot. It is evident that a more perfect combustion can be obtained in this way than by merely blowing air through a thin layer of fuel on a grate, partly, because products, which in the ordinary apparatus are lost, are utilized in this one, and partly, because the combustion on the grate is itself very economical on account of the light blast. These reasons make this apparatus an economical one, and for all such purposes as the evaporation of water, and heating to low temperatures, the use of a special combustion chamber appears to offer decided economical advantages. Our illustration shows the application of the chamber to a locomotive boiler. For railroad purposes this has the disadvantage of requiring a somewhat longer boiler than the one in ordinary use. But for stationary engines this cannot be counted as a serious drawback, and the economy of this mode of heating would appear to be sufficient to warrant its use. It has been applied with success in heating houses and churches, and the freedom from the soot and coal dust, ordinarily found in flame from a large fire, is an advantage which will be appreciated by those who have large flues to take care of. Mr. AMORY's patents have lately been extended by the authorities in Washington.



AMORY'S SPECIAL COMBUSTION CHAMBER APPLIED TO A TUBULAR BOILER.

The Lake Superior Tin Swindle.

THE following letter contains the only information we have about the salting of a tin mine on the North Shore of Lake Superior. As we have referred to the fact, we print this evidence now, though it was written some months ago, to the London *Mining Journal*:

"*Sault Ste. Marie, June* 21.—*To the Trustees of the Otter Head Tin Pool.*—In November last I made a cursory examination of the supposed tin lands near Otter Head, on the North shore of Lake Superior, spending only about two hours on the ground, the threatened immediate closing of navigation preventing a longer stay. I took specimens from two veins which I thought contained tin, and a careful assay proved the fact to our satisfaction. Having just returned from making a closer examination of the same lands and veins, I desire to report that I found unmistakable evidences that by artificial means tin had been placed in the fissures and veins, probably in a liquid form, which afterwards assumed the appearance of artificial stone containing the metal. As proof that such was the case I found buried near these veins *four barrels* of silicate of soda, a box containing clay, and other materials, which I suppose to have been used in carrying on the deception practised upon the gentlemen who made the necessary hasty examination in November, 1872, in company with Mr. PENNOCK. I found the original vein; the matrix had been worked out with a pick for some depth, and then filled with an artificial rock containing dressed tin of a high percentage. I must admit that at the time of my first visit I was deceived, and attribute the deception to the very short time given us for examination, which, under the circumstances, could not be thorough—and now declare it a fraud and swindle perpetrated, aided and abetted by men whom I could not believe would be guilty of so base a transaction. I regret ever having seen or heard of the property, yet it may prove valuable in other minerals, which I hope may be the case for all interested.—WM. HARRIS."

"Negociations had been entered into for the sale of a portion of these lands for $500,000. The gentleman who was empowered to close the purchase left Detroit to see and endorse the statements made regarding the tin lands; before his arrival on the ground, the exposure had been made. There is no question about the presence of tin, the open question being how it got there. Several barrels of tinstuff have been shipped, and specimens distributed throughout the country. It was no niggard hand that did the salting. I happened to see a piece of the artificially made vein rock; the tinstuff was broken into pieces from the size of a filbert up to an egg, and mixed in the concrete; the whole mixture was tolerably firm, the cementing material being of a brownish color, specked with green; the tinstuff was nearly white, and apparently came from a soft granite."

Steel-Lined Cylinders for High Pressure Engines.

MR. WILLIAM ALLAN lately stated at a meeting of engineers and shipbuilders in Glasgow, that in endeavoring to ascertain the reason why steamships were not able to maintain on their regular voyages the fuel economy shown on the trial trip, but on the contrary burned an amount of coal which seemed to increase with each voyage, he found in one case the steam cylinder and also the piston had been very unequally worn. He therefore came to the conclusion that high

consumption of fuel was due to the loss of steam by leakage. The cylinder was rebored and lined with a hard iron mixture, upon which the consumption of fuel was reduced to near the point of the trial trip. The mixture used was 10 of marine scrap, 7 of No. 3 Summerlee, and 3 of cold-blast pig, and cylinders made of it wore freely. Even when made of a harder mixture, they did not cease to wear unequally. About two years ago his firm resolved to try steel for the liners for the high-pressure cylinders, by way of experiment, and they obtained a steel shell from Messrs. VICKERS, Sons, and Company, Sheffield, which they used for the high-pressure cylinder of a compound engine which they were building for the screw steamer "Achilles," 140-horse power. When delivered, the shell presented the appearance of a clear cast, and had a clear bell-like ring when struck with a hammer. It bored easily, had a close soft-looking grain, and, when finished, it had a smooth glassy appearance, and showed not the smallest blow-hole. It withstood all the criticism of inspecting engineers and others. At length, the engine was finished, the liner being fitted into the outer cylinder shell. An annular space was left as the jacket, and the piston was of the ordinary form and make. Steam being got up, everything worked well and quietly; no "seizing" took place. During a trial trip of six hours the suspicions of the suspicious were not verified. The first voyage of the vessel was to Alexandria, from which place she sailed to Odessa, from thence to Dunkirk, and back to Sunderland. From Alexandria, it was reported that no deviation had occurred with the cylinder, and it was the same by the engineer's gauge as when it was fitted. When the vessel returned to Sunderland her cylinder was opened out, and on being gauged by the boring-gauge of the works, it was found to be just the same as when it was bored; indeed, the tool-marks were still visible upon the surface, and the piston packing ring was in every way as originally fitted. After the vessel had made another Black Sea voyage and returned home, the liner of her cylinder was again gauged, when it was found to be in every respect the same as when it was fitted; and even after the vessel has now had eighteen months' continuous running there is no sign or indication of wear in the liner. From the facts adduced in his paper, Mr. ALLAN said it would be seen that steel for liners for compound marine engines could be used with success. As regards first cost, there was certainly an increase over a cast-iron liner; but the latter would weigh more, and in order that it might be made to last for two years without wear it would require to be of a hardness that would entail tedious and difficult boring, the cost of which would equal, if it would not even exceed, that of the easy-bored, light, unwearing steel liner supplied at 60s. per cwt. The author did not go into the causes or assumed reasonings which might naturally be brought forward to account for the devious or erratic wearing of the internal surfaces of inverted compound high-pressure cylinders, nor was he prepared to say or prove that cast iron, at a certain temperature, and under friction, did suffer change, so that its nature was, to a certain extent, weakened or destroyed. But he could say that such wearings did take place and exist in the high-pressure or heated cylinder, while the low-pressure cylinder remained virtually intact. He had gauged ninety pairs of compound-engine cylinders by different makers, some having the jackets cast in, others having hard cast-iron liners inserted, and he had invariably found a substantiation of his views that the high-pressure cylinder wore soonest, while the low-pressure cylinder remained good and true.

Slickensides.

THE finding of highly polished surfaces in mines, the surfaces appearing to have been produced by motion under great pressure, is so common an affair and the phenomenon is in itself apparently so simple, that it is somewhat remarkable to find geologists still disputing over its cause. When the opposite sides of a crevice are found to be formed of sheets of polished material, the latter may be due either to motion under pressure, or to the action of intensely hot vapors, also acting under great pressure. But what is to be said of a crevice that has only one wall polished; of a vein which in addition to one polished and one unpolished wall, contains boulders which show one smoothed and one natural surface? What force is it that has produced polished surfaces on all three sides of a wedge-shaped rock? It is certainly possible that motion may have been had by one means or another over each of the sides, but is it not more plausible to refer such phenomena to the action of pressure alone? It is not in mines alone that slickensides occur. Mr. AITKEN, F. G. S., lately exhibited in Manchester, England, specimens from the millstone grit, and also one of limestone which had been obtained at Ingleton from the beds which overlie the coal measures there. There was a bed of rock, 500 ft. in thickness, composed entirely of red sandstone, close on one or two beds of limestone. There was great difficulty as to placing these beds, whether they belonged to the Permian or the coal measures. He had searched for fossils in order to decide the date, but was unsuccessful. Mr. AITKEN then proceeded to describe some highly polished slickensides which he had discovered in a bed of millstone grit, the third of the Geological Survey, and the upper, according to the classification of Lancashire geologists, on Stansfield Moor. In touching upon the division of the strata which had been the cause of the slickensides, Mr. AITKEN said it was highly probable that the motion had been of an oscillatory character, continued for some time, either uninterruptedly or at intervals; for it was impossible to conceive that one gentle slide would grind down and polish surfaces of coarse-grained millstone grit so completely as in this instance. The specimens also bore indications of the effect of heat in the discoloration of their surfaces to the depth of about half-an-inch, and there was little doubt that the friction of the rocks, and the enormous pressure to which they were subjected during the upheaval of the Pennine Chain, which caused extensive disruptions of the strata over a wide area, and the formation of the almost numberless faults which ramified through the disturbed district, resulted in the production of a vast amount of heat. After describing slickensides in other districts, Mr. AITKEN said it would appear that slickensides, at all events in this locality, were the result of convulsive motion continued for some time uninterruptedly or at repeated intervals, and to the action of the heat necessarily resulting from the friction of the two bodies, and that the highly glazed appearance of the surfaces was solely attributable to these causes, and not the result, as was sometimes contended, of a siliceous coating subsequently deposited by the passage of water or heated vapor. An animated discussion followed the reading of the paper. Mr. DICKINSON said an inspection of the sides of the slickensides would show that they had not been moved backwards and forwards, but in one direction on one side of the fissure and in the opposite on the other side. All these faults had been caused by dislocations, some by a down slip, and some by a horizontal movement. MR. PLANT could not agree with what had been said as to the cause of the highly-polished surfaces of the slickensides. He thought it had been due more to the action of water, and that if there had been great heat it would have had more of a tendency to adhere to the two sides. Mr. BOYD DAWKINS referring to the surface color of the slickensides, said rocks had generally altered in color near a fault. With regard to the polishing of the surface, he thought it had been done when the rock was much softer than at present, and when water, as well as heat, was present. Mr. DICKINSON thought all the rocks must have been plastic at one time, or they could not have been bent as they had been.

On Cannelite.

BY AUGUSTUS A. HAYES.*

THIS name has been applied to a carbonaceous mineral, occurring in Kings, Albert, and Westmoreland Counties, New Brunswick. Under the name of Baltimore and Bituminous Shales, it has been long known, and in connection with Albertite has acquired considerable interest.

A few years since, Prof. H. Y. HINDand myself were engaged in a careful exploration of parts of these counties for minerals of economic value, and to determine the presence or absence of petroleum in reported localities.

The entire absence of bitumen in this mineral, its interest in a scientific connection, and value as a source of hydrocarbons, led us to distinguish it from all other hydrocarbon minerals, and name it cannelite.

In geological position the mineral occurs in the lower Devonian rocks. Alternating beds of remarkable uniformity are shown at various sections, at Baizeley's Farm, on Tuile Creek, and at several other points; the extreme length of area on one line exceeding 50 miles. There are shaly aggregates, containing carbon more or less diffused through them, but this mineral does not pass into them by gradations, and preserves its physical character and chemical composition quite evenly throughout its beds. With the slight diversity which is seen in coal samples from different parts of the same mine, it agrees.

CHARACTERS OF CANNELITE.

COLOR.—Some shade of dark brown; streak, light yellowish brown; luster, dull, earthy; fracture, uneven; structure, slightly lamellar. It is traversed everywhere by thin layers of albertite. Often these are very thin and numerous in the thickness of an inch. When the layers are bent short the albertite is most abundant in the ends, and, finally, perfect mirror-like surfaces may be obtained by splitting the mineral at its layers. The general aspect of this body is that of finely divided, solidified mud, through which black, brilliant gum has been disposed in layers. Specific gravity varies from 1.353 to 1.396. Breaks with difficulty. The samples analyzed were taken from spots miles apart, and the results represent the extremes of variation.

ANALYSES OF CANNELITE.

The method pursued I shall describe now in detail; here the results are given as the basis of the economic value and fitness in application of this mineral to gas manufacturing.

When heated, this mineral crackles, gives off a slight odor of naphtha, with a little vapor of water. At a high temperature vapor of naphtha burning with a clear flame, followed by a denser oil, becoming smoky. In close vessels the fragments after heating to redness are slightly tumefied.

The combustible matter burned off completely leaves a light yellowish ash, occasionally dotted by darker spots. This ash is of the same composition as the sandstone in closing the beds. The unaltered mineral affords the same *cementing* salts as the sandstone rock, and may be taken as a mixture of the most finely divided silt of the rock, mixed with pulp of humus in water; subsequently cemented and consolidated under the conditions favoring stratification. This fact has a scientific value.

The cannelite becomes dry at 420° to 440° Fahr. One hundred parts afforded:

	I.	II.	III.
Water Vapor 240° C.	1.	1.	1.
Volatile inflam. matter	42.90	44.5	41.5
Carbon in coke	17.70	18.0	20.
Mineral matter	38.40	36.5	37.5
	100.	100.	100.

Viewed in the light these analyses afford, we have in cannelite a congener of Torbane Hill mineral or Boghead coal, and as we are able to produce the hydrocarbon mineral of the cannelite, mixed with, and disposed in, the silt of a sandstone, so we may suggest that the discussed Torbane Hill mineral is a more evenly

*In *Gaslight Journal.*

mixed hydrocarbon mineral, with the silt of cannel coal—a fire-clay—without a trace of bitumen being present. Considered as representing Albert coal, cannelite has a high economic value in the gas manufacture.

CANNELITE AS AN ENRICHER.

Albertite and Boghead coal have been placed at the head of the list of enrichers of illuminating gas. As it is my purpose to show at another time, why we so rate these two bodies so highly, I will confine my remarks to the practical point most prominent in this connection.

Albertite and Boghead coal in the 100 are represented by

	Albertite	Boghead Coal.
Moisture afforded at 200° C.....	0.5	1.5
Vol. inflam. matter.....	60.0	62.0
Carbon in coke.....	38.0	12.0
Ash.....	1.5	24.5
	100.	100.

Both of these coals are paraffine producing minerals, and hence the gas from them is charged with vapors which resist cooling well. We may, therefore, ascertain the comparative value of cannelite, albertite, and Boghead coal from their proportions of volume of inflammable matter afforded. Thus Boghead coal being 62.5, cannelite has a value of 68.6 per cent. Both cannelite and Boghead coal must be worked without mixture with coal; the gas formed from each being mixed, as produced, with that of "basis" coal.

The present is a favorable time for substituting cheap basis coals for better gas coals, carrying the candle power of the gas higher by the enricher used in a relatively small proportion.

All the beds of cannelite are near water transportation; the more distant ones can be opened to tramways having a descending grade to tidal rivers. The country is traversed by good roads, and the population interested in developing their resources.

What is Bitumen?

PROF. WURTZ, the able editor of the *Gaslight Journal*, says: Dr. HAYES's great learning and long experience give to his views and statements great authority and value. One point only we shall at present be able to glance at. The remark that "coals are never bituminous, and true coals are distinguished from other forms of oxidized hydrocarbons by the absence of bitumen" is very significant, and if we can devise an appropriate definition for the word *bitumen*, must of course be accepted. To us, however, here lies the difficulty. What definition shall we assign to bitumen? While the term bituminous coal is doubtless highly objectionable, there are many other terms applied in common language to carbon minerals which are quite as meaningless and unscientific. Even the term *coal* itself is undefinable. Asphalts, cannels, naphthas, petroleums, are other examples of terms which respectively include mineral matters differing widely from each other in chemical composition and properties, and doubtless in modes of formation.

As to bitumen, DANA makes it a synonym of asphaltum, itself applied indiscriminately in the text-books to every solid combustible, which is either easily fusible, easily soluble (in something or other, it matters little what) or which has some kind of an odor. Albertite is insoluble and inodorous. Hence at first it was a "coal." Then it was proved that it was fusible under pressure; hence it wasn't a coal, and must be an asphalt; these two being the only species admitted by the Procrustean theory of the geologists of the era now passing away, a theory to which all the facts must be strained to fit. Grahamite, which is also inodorous, cakes or admits of pasty fusion, also, under pressure: hence it must also be an asphalt, though chiefly composed (80 to 85 per cent.) of the remarkable constituent called by the writer *irisine*, which is infusible at any temperature or pressure, though wholly soluble in many liquids.

Our own preference would be in the remodelling of the *scientific* nomenclature of carbon minerals—which must of course long precede any reformation in the language of *hoi polloi*—to cast aside pretty much all these prostituted terms, or at least, not let our minds and our thoughts be governed by them; but, through rational chemical investigation, arrive, as soon as we may, at some scientific basis for a *new* classification and nomenclature. Wisdom and learning are two things. Wisdom has learned to unlearn.

Colorado Coal.

THE area of land known to be rich in coal deposits in Colorado is about 7200 square miles, lying in various parts of the Territory, on both sides of the main range. There can hardly be a doubt but that this extent will be largely increased in years, for new discoveries are constantly being made upon the foot-hills and plains.

Our coal lands may be separated under heads depending more upon their geographical position than upon the character of the fuel:

1. The northern mines.
2. The eastern foot-hill mines.
3. The southern mines.
4. The Summit County mines.
5. The Conejos County mines.

Of the first but little is known. Weld and Larimer Counties are undoubtedly underlain by veins of lignite similar to those of Wyoming, which are at present furnishing an excellent fuel for steam engines, domestic purposes, and for some metallurgical processes. Coke made from the Wyoming coal-fields was tried at both Golden and Denver for smelting silver and gold ores, and though subsequently discarded in favor of Pennsylvania coke, is considered to be a fair fuel.

The eastern foot-hill mines embrace the veins outcropping in Boulder and Jefferson Counties, nearly all of which have been known since the early days. They are producing at present three-fifths of all the coal mined in Colorado, which is about 120,000 tons, and being located nearer the center of population than any of the other fields, will probably hold this prominent position for a long time. Among the noted mines are the Murphy, Marshall, Erie and Davidson.

The Murphy vein stands nearly vertically, with an occasional dip to the east or west. Its course is about north 20 degrees west, magnetic, and its thickness from twelve to eighteen feet of solid coal, with scarcely a parting of shale or slate. The main workings now lie mostly upon the north side of Ralston creek, which has cut through the bed and exposed its outcroppings very markedly on either side. Nearly 2000 feet of the vein is opened. The coal is a very good sample of the product of all the foot-hill mines. It is an altered lignite that burns freely, and crumbles quickly on exposure to the rain or moist air; burns well under the boiler and in the grate, and answers excellently for nearly all the uses to which mineral fuel is put. The following is an analysis made in 1871 by E. W. ROLLINS, of the Massachusetts Institute of Technology, Boston:

Hydrogen.....	4·00 per cent.
Carbon.....	66·50 " "
Ash.....	7·05 " "
Oxygen, Nitrogen, and Sulphur.....	22·45 " "
	100.00

The Erie bed lies nearly flat, dipping to the east. It is operated by the Boulder Valley Coal Company, and furnishes nearly all the fuel used in Denver and Boulder City. It is the most extensively worked vein in Colorado, and yields a fuel that is considered rather purer than any of the other neighboring beds. The Marshall vein is generally supposed to be a continuation of the Murphy to the north, as it is of a very similar character in almost every respect. The Davidson bed was struck in the latter part of September, 1873, at a depth of 530 feet below the surface. It is twelve feet thick, and when exploited, is very liable to furnish a denser class of fuel than any yet taken from the Colorado plains.

East of Denver, along the line of the Kansas Pacific, indications of coal are not wanting. The same formation that is found along the foot-hills, tilted up in a nearly vertical position, underlies the whole of eastern Colorado, which is one vast lignite basin, containing stores of this truly precious mineral. It is not too much, we think, to place the probable coal area of the Territory at 100,000 square miles.

The southern mines embrace those of Trinidad and Fremont County, and furnish a class of mineral entirely different from any yet found in the Territory. The latter are the oldest mines and the best known, and have at times produced at the rate of 100 tons per day. Their present production we are not aware of, though it can hardly have decreased, as the demand for it is great, not only for household use, but for the manufacture of gas in Denver.

The Trinidad mines furnish a coal similar in many respects to that of Canyon City.

The Summit County mines are not worked by any parties, and it is doubtful even if the beds have been claimed or taken up, as they have only lately been brought into notice. The report of the survey lately made by Mr. BRUNE furnishes almost all that is known of these deposits. They are located on the divide between the Bear and White Rivers, and consist of several seams varying from 5 to 15 feet in thickness, which, owing to the contorted state of the strata, lie in a variety of positions, from a strict horizontal to a perfect perpendicular. Above is a stratum of sandstone varying from one to three hundred feet in thickness.

The coal is of two kinds, one a hard lignite and the other similar to what is called albertite, a mineral fuel of great value as a gas generator.

It will be a long time before these deposits prove of any intrinsic value, on account of the thinness of the population in Summit County, and their distance from any railway or market. The country north of this divide, however, according to Mr. BRUNE, is capable of sustaining a large agricultural population, and in addition to this there will, in time, spring up extensive smelting interests along the western flank of the range, both of which industries will create a demand for mineral fuel, which can be more cheaply supplied by these mines than by any other now known in that region.

The Conejos beds are also new discoveries of which but little is known. Sufficient outcroppings of coal, however, have been noticed below, and west of, Las Animas or Elbert, to indicate the existence of extensive lignite deposits there. The mines are hardly opened yet, but situated as they are, not more than thirty miles south of the center of the San Juan gold and silver district, it will be but a short time before their product will be called for, should they prove at all suitable for metallurgical purposes.—*Colorado Mining Review.*

WAGES IN ENGLAND.—The ironmasters of the Midland district have now resolved upon a decided course of action with respect to the wages question. At a meeting lately held in Wolverhampton, they agreed upon a maximum wage-rate, involving a reduction of 9d. per ton on the present scale, to be enforced from January to April, 1874. Meanwhile, the selling price of iron in two districts of South Staffordshire and the north of England will be ascertained, and the future basis of the remuneration of puddlers determined with reference to the average of the results thus arrived at. This arrangement is to be binding on both parties till 1877.

Engineering and Mechanical Notes.

PROPOSAL FOR A THIRD ALPINE TUNNEL.—Italy appears to derive more benefit from the prevailing passion among engineers for great works, than any other country. To those fond of tunnel-making her Alps afford the most brilliant field of activity. She already has the Mont Cenis tunnel, that of Saint Gothard is under way, and now it is proposed to pierce grand old St. Bernard by a passage way 5,800 metres (about 6,380 yards long). It is proposed, says "*Iron*," to construct this tunnel in four sections, by means of side galleries, so that the work may be completed in three or four years. These working galleries will remain open afterwards for ventilation and other uses. A peculiar feature is that it is proposed to form a station within this tunnel by widening 600 metres of the level, central portion; one of the objects which has led to this singular plan is, that possibly for economy's sake two light trains which had made the ascent separately might be joined together for the descent on the other side. It is also argued that with such an arrangement many tourists would be glad in the summer season to attain the summits of the group of the Grand St. Bernard by the inclined passages already referred to, and at the mouths of which stations for refreshment, and even for lodging, might be established." The cost of this part of the work is estimated at only 17,000,000 francs; but to make the great tunnel of use, a railroad will have to be built through a most difficult country requiring several other tunnels of less size; so that the cost of the whole work is put (in advance) at 90,000,000 francs, or close on $18,000,000, gold.

THE AUSTRALIAN GOLD MINES maintain their prosperity. During the quarter ending June 30, 1873, the total yield of gold obtained was 283,248 oz. 3 dwt., of which 159,604 oz. 17 dwt. was from quartz mining, and 123,643 oz. 6 dwt. from alluvial mining. The number of miners at work was 52,885, of whom 21,730 Europeans and 14,076 Chinese were engaged in alluvial mining, and 17,010 Europeans and 69 Chinese in quartz mining. These figures, taken in conjunction with the gold obtained from quartz and alluvium, show vastly in favor of quartz-mining as regards the yield per man, as it appears that whilst 35,806 alluvial miners obtained only 123,643 oz. of gold, 17,079 quartz-miners obtained 159,604 oz.

FALL IN WAGES IN ENGLAND.—*Iron* illustrates the condition of trade in England by taking Sheffield as an example. It says: But a short time since the steel trade of Hallamshire represented a gigantic and thriving industry. The great steel manufacturers were working full time and double shift, while their productions usurped the markets of the world. Dear fuel and high wages have together increased the cost of production beyond trading limits. Cast steel makers have reduced their men to half time and single shift, and are now only carrying on in the hope that better times may redress the present unprofitable outlay of capital. Last of all the departments of iron industry to feel the pinch of hard times was the Bessemer steel trade. Favored by increasing demand and a certain economy of fuel, this manufacture survived by some months the decadence of crucible steel, but at last the great makers have been forced to announce a reduction of wages as the only method of enabling them to hold that vantage ground over the foreigner on which the success of English commerce depends.

UTILIZATION OF CINDERS.—Cinders, it is well known, contain a very considerable proportion of unburned carbon, and on picking over some cinders from a boiler grate the ash was found to be only about 27 per cent of the weight, showing a considerable loss of heating material. Mr. CHARY, of the Dortmund Smelting works, attempted to recover this lost material by blowing compressed air down on the cinders as they fell from the grate. The heating power obtained was about one-half that of the coal, but difficulty was experienced in removing the slag formed. This, in short, is just what might have been expected. Cinders can be utilized like any other poor fuel by burning them in a gas generator, but this generator must be provided with some means of disposing of the slag formed from the ash of the coal.

SAFETY IN NOXIOUS GASES.—Experiments have been made at Wigan with the Aërophone of Mr. DENAROUZE, spoken of on p. 402, vol. XVI. The Aërophone is of two kinds—a low-pressure apparatus, which requires that air should be pumped to the miner through india-rubber tubing from the nearest point at which pure air can be found; and the high-pressure apparatus, which enables the miner to carry his own supply of air in tanks, and thus makes him independent of communication from without. The low-pressure apparatus consists of an air-pump; a strainer, which arrests all particles of coal dust held in suspense in the air; an air-tube wound on a self-regulating coil; a regulator, carried on the miner's back; and, lastly, the special lamp. The two chief novelties are the regulator and the lamp. The former, as its name implies, regulates the supply of air both to the miner and the lamp. For the high-pressure apparatus a compensating air-pump is used, by means of which 275 gallons of air may be raised to a pressure of thirty atmospheres in less than fifteen minutes, a point never hitherto attained. The air-pump fills certain portable reservoirs or tanks, with compressed air at a pressure of twenty atmospheres. To one of these tanks or reservoirs is attached the tube which supplies the miner and the lamp with air, and this is further attached to the regulator which the miner carries on his back. Over the supply of air he has full control, being able to regulate it at pleasure, either for his own breathing or for the light of his lamp. He can carry six tanks so filled to the point where he wants to work or which it is necessary for him to explore; and these will feed him and his lamps for more than three hours. "As the supply draws to an end," says the inventor, "it would be perfectly practicable to send a second miner, carrying his own supply of air, with fresh reservoirs for the men working in the infected air. The exchange of empty for full cylinders can be effected without the least interruption to the work; and thus a practically inexhaustible supply of pure air can be assured to the miner, no matter at what distance he may be from the pit's mouth. In the experiments at Wigan, the lamp, which forms part of the apparatus, was shown steadily burning under a glass globe in an explosive atmosphere of gas; and secondly, a hut was filled with a suffocating compound of gases, which killed a cat placed in the hut, and into this hut Mr. APPLEGARTH, armed with the French apparatus, entered, and remained there long enough to make a box, coming forth unharmed. Mr. PICKARD also entered the hut, and not content with the security which the apparatus gave him, he removed the mouthpiece to test the poisoned atmosphere of the hut; the result he described as having nearly been fatal to him. While these results were satisfactory, it is extremely doubtful whether the Aërophone can be profitably used for any work but the occasional one of exploration or rescue.

CORRESPONDENCE.

The Utsch and Cazin Jigs.

From the Missouri Backwoods, Dec. 22, 1873.

TO THE EDITOR: SIR—Shortly after receiving your issue of Dec. 9, containing an article on the CAZIN jig, in which my name is variously mentioned, I left home on business, and having my attention engrossed by more important matters, did not find leisure to reply to it sooner. The writer, although introducing himself as an entirely disinterested spectator, who has only furtively seen the CAZIN jig at work,—and the UTSCH jig never,—shows but too plainly in the course of the article that he occupies the position of an uncalled-for assailant. In my former communications I have not referred to the CAZIN jig at all. I described the operation of the UTSCH automatic jig and pointed out its excellent features. I had no cause to say anything against the CAZIN jig or its inventor, and I especially forbore to mention it, because I could hardly have done so without disapproving of its construction. There is a great scarcity of experienced ore-dressers, and we need them badly for our mining regions. I would have considered it ill-timed to place any obstacle in the way of a man of Mr. CAZIN's apparent attainments, merely because he has constructed, and is trying to introduce, a machine which I consider no improvement on known devices. I must, however, say some words in regard to that article of Dec. 9. The writer remarks that "for separation there appears to be a competition between CAZIN's one-plunger jig and the UTSCH jig." He forgets that there are numerous other designs of considerable merit, patented and unpatented. I have said of the UTSCH jig that it is very effective, works up large quantities, is a good concentrator, separates several different minerals in one operation, is saving in manual labor and, therefore, in expense, and requires very little attendance, supervision and repairs. I can conscientiously advocate its introduction above all other jigs, wherever large masses of materials are to be treated which do not require too fine crushing. I would not use it for grain under 1·25 inch diameter. For the treatment of coarse grains it does not come in competition with the CAZIN jig at all, because the latter can treat only medium and fine-grained stuff. For a grain under 1·25 inch diameter, I would not hesitate to recommend the use of the CAZIN jig, if I did not prefer a machine built in some respects similar to the CAZIN pattern, but with a separate plunger to each sieve. Mr. CAZIN's machine is an imitation of jigs which have for several years been used in Germany and elsewhere with excellent effect (and on which I regard our fine-grained jig at Lasalle as an improvement), with the only essential difference, and that the one which I must designate as the reverse of an improvement, that he has replaced the several plungers by a single one of great length.

What a clumsy contrivance is a plunger 16 feet wide! how strongly must it be braced to avoid vibrations! And the stroke, whatever it may be at one end of the plunger, is zero at the other end. But the most experienced ore-dressers give the longest stroke to the middle sieves, which will bear more of it than the first one. In this case, the too slight and slow strokes of the last sieve must render them almost useless—at least very inefficient—appendages. The mechanism for setting the plunger in motion, claimed in the article referred to as a peculiar advantage of the CAZIN jig, is a well-known device of recognized excellence. It is likewise used in the UTSCH jig, and has equally been adopted in Germany for the fine-grain jigs with several plungers and small stroke. Where the stroke is small, however, excentrics give a very simple and serviceable movement. The statement in the article that the quantity of work done by different kinds of jigs is dependent upon the relative area of their sieves—revolutions and stroke being equal—is obviously incorrect; the difference between an efficient and an inefficient machine is ignored in it, and the statement can be true only of different sizes of the same machine.

The testimony adduced in regard to the working of the CAZIN jig has doubtless been given in good faith. It might readily be duplicated for every machine extant.

I do not wish to convey the impression that the CAZIN jig is, in my opinion, an utterly worthless machine. I believe that fair results can be obtained with it, if it is handled skilfully. But I do not hesitate to assert that its original, the fine-grain jig of the Harz mountains, as now built, and analogous constructions, such as the fine-grain jig now used at the works of the Matthiessen and Hegeler Zinc Co., at Lasalle, are far superior to it. I have never claimed the UTSCH jig as a "slime-jig." I have, however, said in a former article that we use a modification of the Hartz jig, with several plungers and slight but numerous pulsations, for jigging slimes with very satisfactory results. This motion could not be given to the unwieldy plunger of the CAZIN jig.

H. ENGELMANN.

THE COAL TRADE.

NEW YORK, Jan. 8, 1874.

The beginning of the year is always a time for closing up accounts rather than for buying and selling, and accordingly we find little doing in either the hard or soft coal trade. The mildness of the season, together with the partial continuance of light work in the manufactories, has had its effect upon the price of coal, in spite of the still determined combination, as we reported last week. It might be expected that bituminous coal would suffer a fall in consequence, but the fact is there is so little doing in that trade that prices are of no account. The extreme mildness of the weather and consequent navigable condition of the streams occasionally tempts some inland dealer to lay in a stock while cheap transportation is still possible. But the great sources of demand have been reduced. Foreign steamers bring all the coal they need, and as one dealer remarked, they seem to bring nothing but their own fuel. Freights have fallen off in amount so much as to have the most decided effect upon ocean transportation, and consequently upon the bituminous trade. By the kindness of Mr. MACKIE Secretary of the Consolidation Coal Company, we are able to publish the fact that the amount of bituminous coal carried by the C. & P. R. R. in 1873 was 2 215,875 tons, being an increase of 353,053 tons over that of 1872. The Consolidation Company mined 548,485 tons in 1873, an increase of 44,353 tons over the production of 1872.

There has been a great deal of talk in the daily press about a "new combination" which is represented to be a "union of the New York and Philadelphia combinations," and the little finger of which is to be thicker than the loins of that coalition which has been such a bugbear during the past year. We believe the grand consolidation of forces referred to is the union of the Wilkesbarre and Honey Brook companies, which we announced some weeks ago and which cannot affect in any way the position of the wholesale trade to its customers, as both of the old companies occupied toward the combination the same position that the new company will hold.

Philadelphia and Reading Coal and Iron Company's prices of coal for January:

	Port Carbon.	Sch'k'l Haven, by R.R. & Can'l.	Port Clinton.
Lump, steamboat and broken	$2 90	$2 98	$3 10
Egg, stove and small stove	3 15	3 23	3 35
Chesnut	2 40	2 48	2 60
No. 2 Chesnut	2 15	2 23	2 35
Pea	1 25	1 33	1 45

The coal mines of the Schuylkill region are putting out but very little coal. The Philadelphia and Reading Coal and Iron Company, with a stock of about 100,000 tons at Port Richmond and stocks elsewhere, is in a position to exact the reduction in wages which they claim. The Wilkesbarre companies are also doing very little work, though there is no question of wages involved in the stoppage. The Pennsylvania Coal Company, which finds no difficulty in disposing of all its coal at the reduced price noted in our quotations, is working three-quarter time; in fact, during December and January, the days are so short that the work of preparing the coal, picking out slate, &c., cannot be done usually after four o'clock, so that when the company puts the men on three-quarter time it simply means that the pay will be reduced to three-quarters, while the amount of coal remains about the same, as though the mines were nominally working full time.

Under the consolidation of the Honey Brook, Wilkesbarre Coal and Iron Company and the Lehigh Navigation Company, a much larger output of coal will probably be secured. The product of the Mauch Chunk mines has rarely attained 500,000 tons a year, while the new lease calls for a minimum during the first two years of 800,000 tons, and after that of a million tons. The royalty to be paid is, we understand, 21½ per cent. of the price of coal in Mauch Chunk. This will be equivalent to a royalty of about 70 a 75 cents per ton.

The furnace men of the Lehigh *talk* of blowing in again this month, but the iron trade is still very dull, and it is probable that but a small number will get to work before the first of February.

Fire in the Old Baltimore Mine, at Wilkesbarre, Pa.

The "Old Baltimore Opening," so well known to nearly all visitors to the charming Wyoming Valley, has disappeared as a point of scenic interest, but now attracts probably more attention by its absence than it ever did by its existence. The Delaware and Hudson Canal Company has been "robbing" the pillars in that portion of the mine of which the "old openings" were the outcrop, and on the night of the 6th inst., about four acres of the mine "caved in," crushing boilers and engines used to work an inside slope, and setting fire to the coal. As no night work was carried on, it is not supposed that any men were in the mines at the time, and as there were no buildings on the surface, no great damage has been done, except setting the mine on fire, and in such a way that it will be exceedingly difficult, if not impossible to get at the fire and extinguish it.

There is now scarcely a mine, having boilers inside, in this part of the Valley, which has not at some time been on fire. If the flues are made secure, the roof has fallen in and set the coal on fire, by knocking over the underground boilers. Putting out fires in a mine is not always possible, and even when it can be done it is invariably an exceedingly costly operation. It always greatly injures and sometimes entirely ruins a mine, and it would seem that the companies having so much at stake would prohibit the use of boilers under ground under any circumstances.

The fire in the Kidder slope of the Wilkesbarre Coal and Iron Company is exceedingly serious, and is not yet under control. The difficulty of getting at a fire in the mines is very great; for if a current of air sufficient to carry off the gases from the combustion of the coal can be maintained, it at once fans the fire and increases its extent, while if no energetic ventilation is provided for, the gases prevent approach to the fire, and consequently it cannot be extinguished. It seems probable the fire can be confined to its present limits, say 5 to 8 chambers, but it will certainly be a very tedious and expensive work to extinguish it.

Since writing the above the signs of fire have disappeared, and it is supposed that only some timbers about the boilers was burnt, and that the fire was not communicated to the coal.

Coal mined and carried on the Philadelphia and Reading R. R. and branches—in year ending Nov. 30, 1873, from advanced proof sheet of the P. & R. R. R. Co's., Annual Report.

Amount of coal received from various lateral railroads in coal region:—

Schuylkill Valley Railroad	50,842.11	
Mill Creek Railroad	170,746.04	
Mahanoy and Shamokin Branch	1,520,972.09	
Total at Port Carbon		1,742,561.04
Mount Carbon Branch, at Mount Carbon		145,645.16
Mine Hill and Schuylkill Haven Railroad, at Schuylkill Haven		1,443,134.10
Lebanon and Tremont Branch, at Pine Grove		366,007.01
Little Schuylkill Railroad, at Tamaqua		642,972.08
		4,340,320.19
Received at Harrisburg and Dauphin	222,006.03	
Received at Allentown and Alburtis	8,875.15	
" " Oreland and Willow Street wharf	80,081.16	
" " Summit, Catawissa and Rupert	344,259.00	
		655,222.14
		4,995,543.13
Bituminous received at Harrisburg and Belmont		323,354.02
Total		5,318,897.15
Coal passing over laterals for shipment by canal	735,047.01	
Coal shipped west via Northern Central Railway and Catawissa and Williamsport Branch	301,838.00	
Coal consumed on laterals	190,770.12	
		1,227,655.13
Total of all, tons of 2,240 lbs		6,546,553.08

FROM.	Total Paying Freight.	Coal for Company's Use.	Grand Total.
Port Carbon	1,609,767.16	132,793.08	1,742,561.04
Mount Carbon	128,724 15	16,921.01	145,645.16
Schuylkill Haven	1,354 044.16	89,089.14	1,443,134.10
Pine Grove	358.236.08	7,770.13	366 007.01
Tamaqua	572,452.08	70,520.00	642,972.08
Lykens Valley and Lehigh	629,267.06	25,955.08	652 232.14
Harrisburg, &c	310,266 15	13,087.07	323,354.02
Total of all	4,962,760.04	356,137.11	5,318,897.15

Philadelphia & Reading Railroad and Branches.

COAL TONNAGE

For the Week ending Saturday, Jan. 3, 1874.

BY RAILROAD.—ANTHRACITE.

PASSING OVER MAIN LINE AND LEB. VAL. BRANCH.

	Tons.	Cwt.
From St. Clair	.....	
" Port Carbon	1,496 17	
" Pottsville	674 14	
" Schuylkill Haven	20,233 05	
" Pine Grove	254 06	
" Tamaqua	7,007 06	
" Harrisburg	3 18	
" Dauphin	11 05	
Total	29 6-1 11	

FOR SHIPMENT BY CANAL.

Passing Frackville Scales	.....
" Mill Creek "	.....
" Schuylkill Valley Scales	.....
" Mt. Carbon "	.....
" Cressona "	.....
" Pine Grove "	.....
" Tamaqua "	.....
Total	.....

SHIPPED WESTWARD VIA CATAWISSA AND WILLIAMSPORT BRANCH AND NORTHERN CENTRAL RAILROAD.

Via Catawissa & Williamsport Rr.	99 08
" N. C. R. R. passing Locust Gap	66 03
" " " Shamokin	1,650 00
" " " Herndon	.....
Total	1,816 00

SHIPPED WEST OR SOUTH FROM PINE GROVE

Via Schuylkill & Susquehanna R. R.	682 19
" Lebanon & Pine Grove Branch	44 15
Total	727 04

CONSUMED ON LATERALS.

From Frackville Scales	10 00
" Mill Creek "	346 11
" Schuylkill Valley Scales	388 18
" Mt. Carbon "	697 00
" Cressona "	654 02
" Pine Grove "	73 01
" Tamaqua "	1,282 01
Total	3,372 02

LEHIGH AND WYOMING COAL.

Received via Silverbrook Junction, Sent East	6,200 14
" " Cat. & Wpt, Br. Sent West	.....
" " Rupert, Cat. & Wpt. Br.	.....
" " Allentown E. Penn'a Br.	22 03
" " Alburtis, " "	59 19
" " Oreland, G. & N. Br.	414 18
" " Willow Street R. R.	475 00
Total	7,172 14

BITUMINOUS.

From Harrisburg	4,013 12
" Connecting R. R., G. & N. Br.	.....
" Junction R. R.	10 00
Total	4,023 12

COAL FOR COMPANY'S USE.

Anthracite	3,869 18
Bituminous	153 07
Total	4,023 05

RECAPITULATION.

	Total for Week.	Corresp'g week last year.	Increase and Decrease.
Passing over Main Line and Leb. Val. Branch	29,681 11	20,247 10	i 9,454 01
For Shipment by Canal	1,816 00	4,566 16	d 2,750 16
Shipped Westward via Northern Central R. R.	727 04	311,02	i 416 02
Shipped West or South from Pine Grove	3,372 02	3,080 04	i 291 18
Consumed on Laterals	7,172 14	2,320 19	i 4,851 15
Lehigh and Wyoming Coal	42,769 11	30,506 11	i 12,263 00
Total Anthracite paying freig't	4,023 12	3,553 02	i 470 10
Bituminous	46,793 03	34,059 13	i 12,733 10
Total of all kinds paying freig't	4,023 05	5,086 17	d 1,063 12
Coal for Company's use	50,816 08	39,146 10	i 11,669 18
Total Tonnage for Week	400,884 03	335,303 09	i 65,580 14
Previously this year	451,700 11	374,449 19	i 77,250 12
Total to date			

SHIPPED BY CANAL.

From Schuylkill Haven			
" Port Clinton			
Total Tonnage per Week	11,384 16	6,594 00	i 4,790 16
Previously this year		3,794 0	i 4,790 16
Total to date	11,384 16		

Semi-Bituminous Coal Sent to Market From the Blossburg, McIntyre and Towanda Regions in 1873.

	COMPANIES.	COUNTIES.
Fall Brook Coal Company	312.466	
Morris Run Coal Company	357,384	
Blossburg Coal Company	321.207	
Tioga County		991.057
McIntyre Coal Company	212.462	
Total of Lycoming County		212.462
Towanda Coal Company	252.339	
Fall Creek B. Coal Company	85.315	
Total of Bradford County		337.664
Total of 3 Counties	1.541.163	1.541.163

As compared with the production of 1872, Tioga County has increased 141.695 tons, Lycoming County has increased 41,035 tons, and Bradford County has decreased 33.567 tons.

Delaware Lackawanna & Western Rail Road Company.

Coal transported on the Delaware, Lackawanna, & Western Railroad for three days, ending Saturday, January 3, 1874.

	WEEK. Tons. Cwt.	YEAR. Tons. Cwt.
Shipped North	4,402 11	4,402 11
Shipped South	13,993 03	13,993 03
Total	18,395 14	18,395 14
For the Corresponding time last Year :		
Shipped North	6,585 01	6,585 01
Shipped South	16,931 01	16,931 01
Total	23 516 02	23,516 02
Increase		
Decrease	5,120 08	5,120 08

Penn. and N. Y. R. R.—Coxton, Pa.

Coal tonnage for week ending January 3, 1874.

	Week. Tons. Cwt.	Total. Tons. Cwt.
Anthracite received :		
From Lehigh Valley R. R.	6,895 00	40,658 15
" Lack. & B. R. R.	62 17	1,087 16
" Pleasant Valley R. R.	....	....
" Sul. & Erie R. R.	91 03	1,471 10
Total	7,049 00	43,218 61
Same time last year	8,891 02	47,799 05
Increase	.....	.....
Decrease	1,842 02	4,581 05
Distributed :		
To Lehigh Valley R. R.	24 15	24 14
To Lack. & B. R. R.	....	....
To S. Central R. R.	2 442 18	9,489 01
To Ithaca & A. R. R.	1,861 15	13,491 08
To Erie R. W. Pockets for shipm't.	1,749 08	11,783 01
To Erie Railway, Watkins direct.	481 18	1,736 12
To individuals on line of road	141 05	3,000 19
To points at & above Coxton for use of Co.	206 13	1,948 16
To points between Waverley and Elmira	377 01	1,743 09
Total	7,049 00	43,218 01
Bituminous received from BARCLAY R. R.		
Shipped north from Towanda	4,048 02	21,616 06
Shipped south from Towanda	11 00	148 19
Northern Central R. R.	....	....
Total	4,059 02	21,765 05
Same time last year	4,677 02	23,738 05
Increase	.....	.....
Decrease	618 00	1,973 00
Distributed :		
To Erie Railway	3,958 08	21,046 07
To So. Central R. R.	89 14	559 02
To Ithaca Valley R. R.	....	....
Lehigh Valley, R. R.	6 00	113 16
To individuals on line of Railroad.	5 00	46 00
To points on line of road for use of Company	....	....
Total	4,059 02	21,765 05
Grand totals transported ;		
Anthracite	7,049 00	43,218 01
Bituminous	4,059 02	21,765 05
Total	11,108 02	64,983 06
Same time last year	13,568 04	71,537 10
Increase	.....	.....
Decrease	2,460 02	6,554 04

Report of Coal Transported over Lehigh Valley Railroad

Report of coal tonnage for the week ending Jan. 3, 1874, with Totals to date, compared with same time last year.

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL Tons. Cwt.
Total Wyoming	17,747 07	89,070 03
" Hazleton	26,348 15	73,243 16
" Upper Lehigh	59 01	961 03
" Beaver Meadow	7,569 07	32,027 19
" Mahanoy	4,735 15	27,457 05
" Mauch Chunk	....	86 19
Total	56,460 05	221,847 05
Same time last year	42,708 13	250,442 12
Increase	13,751 12	
Decrease	.....	28,595 07
Forwarded East from Mauch Chunk by rail	41,117 11	159,311 11
Same time last year	35,216 00	209,888 09
Increase	5,901 11	
Decrease	.....	50,576 18

DISTRIBUTED AS FOLLOWS.

Local East of Mauch Chunk	921 17	4,910 10
Forwarded East for use L. V. R.	643 02	4,379 02
Delivered to Furnaces and Manufacturing Companies	8,625 08	31,030 16
Delivered to Cat & Fog. R. R.	370 06	882 07
" " East Penn R. R.	34 01	300 04
" " North Pennsylvania Railroad	5,910 13	16,316 07
" " Port Del.	....	....
" " East Amboy Railroad	....	....
" " Morris and Essex Railroad	4,677 07	18,840 04
" " Bel. Del Railroad	13,852 18	61,091 19
" " Central Railroad	6,078 02	21,370 02
Delivered at and above Mauch Chunk for use of L. V. R.R.	844 13	5,141 14
To P. & N. Y. R. R.	6,895 00	40,658 15
To Northern Central R. R.	923 17	4,320 08
To D. H. & W. R. R.	750 12	1,741 13
To L. & S. R. R. at Packerton for rail	169 12	425 18
To Individuals at Mauch Chunk	....	178 02
To Individuals above Mauch Chunk	116 05	1,193 11
To L. &S.R.R., at Penn Hav., for railroad	66 00	2,845 19
Do. for canal	....	....
To Lehigh Canal Mauch Chunk	....	102 00
To Catawissa Railroad	....	20 00
To L. & B. R.R. at Lack. Junc.	5,576 14	5,576 14
Total	56,460 05	221,847 05

Pennsylvania Coal Company.

Shipments of Pittston Coal for the week ending Jan. 3, 1874.

	1874. WEEK.		1873. WEEK.	1873. YEAR.
By Railway	6,544 17	6,544 17	5,200 08	5,200 08
" Canal	.....	.....	.....	.....
Total	6,544 17	6,544 17	5,200 08	5,200 08
Increase, 1874	1,344 09			

Report of Coal Transported over Central R.R. of N. J. (Lehigh and Susq. Div.)

Week ending Dec. 31—Compared with same time last year.

REGION SHIPPED FROM.	TIDE. tons ct.	LOCAL. tons ct.	CANAL. tons ct.	TL. WEEK tons cwt.	TL. DATE tons. cwt.
Wyoming	14230 12	3681 04		17911 1	1812020 11
Upper Lehigh		2855 00		2855 00	20038 1 08
Beaver Meadow	18.3 08	2084 17		3908 05	346752 09
Hazleton		147 07		147 07	27723 00
Mauch Chunk		99 17		599 17	52220 11
Total	16054 00	9350 05		25404 05	3089697 17
Prev'ly reported	1472403 08	977713 18	614176 08	3064293 14	
Total to date	1488457 08	987064 03	614176 08	3089697 19	
Same time .1872	1155292 19	884146 17	487628 16	2527068 12	
Increase	333164 09	102917 06	126547 12	562629 07	
Decrease					

DISTRIBUTION.	WEEK 1873.	WEEK 1872.	YEAR 1873	YEAR 1872.
Forwarded East by Rail to Tidal points	16054 00	1145 11	1488457 08	1155292 19
Forwarded East by Rail to Local points	5587 04	526 10	470653 13	441638 08
Forwarded East by Rail use Central Division	1653 06	748 06	91620 02	79895 05
Forwarded East by Rail use L. & S.	109 12	29 00	12148 07	8955 17
Delivered at and above Mauch Chunk	1294 14	351 17	85591 01	63894 18
Delivered at Coalport & Hazard for Canal			667759 04	529486 14
Delivered to L. V. R. R. at Packerton	355 00	65 05	25053 19	15800 18
Delivered to L. V. R. Rd. at Sugar Notch			107409 16	
Delivered to L. & B. R. R. at Plymouth Bridge	350 09	1656 09	141004 09	232103 13
Total	25404 05	4522 18	3089697 19	2527068 12

Lykens Valley Coal Company.

Shipments of coal from Lykens Valley Coal Co., for week ending Jan. 3, 1874.

For week ending Jan. 3, 1874	511 02
Total shipment to date	2,901 16

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, Dec. 31, 1873.

	WEEK.	SEASON.
North	22,930 00	2,582,176 01
South	245 03	170,419 10
Total 1873	23,175 03	2,752,595 11
Corresponding time in 1872 :		
North and South	19,136 07	2,930,767 04
Total Increase 1873	4,038 16	
Total Decrease in 1873	.....	178,171 13

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for three days ending Saturday, January 3, 1874.

	3 DAYS.	SEASON.
North	6,950 01	6,950 01
South	....	
Total 1874	6,950 01	6,950 01
Corresponding time in 1873 :		
North and South	18,367 10	18,367 16
Total Increase 1873		
Total Decrease 1874	11,417 09	11,417 09

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, Dec. 20, 1873.

	WEEK.	SEASON.
By Delaware and Hudson Canal	.....	1,368,052
By Railroad, East	13,957	427,130
" West	8,309	570,316
" South	234	170,117
Total 1873	22,500	2,626,215
Corresponding time in 1872 :		
By Delaware and Hudson Canal	.....	1,394,041
By Railroad, East	10,647	528,072
" West	8,861	416,137
" South	4,783	375,534
Total	24,293	2,713,784
Decrease	187,568	

Northern Central Railway, Shamokin Division.

Below is the return of Coal sent over the Shamokin Division of the N. C. R. W., for the 7 days ending Dec. 19, 1873.

	Tons	Cwt.
East	1,525 11	
West	6,301 09	7,827 00
Same time last year		10,748 01
Increase		.....
Decrease		2,921 01
Total amount shipped to date		624,280 01
Same time last year		560,819 10
Increase		63,460 11
Decrease		

Statement of Coal Transported over Cumberland and Pennsylvania Railroad

During the 8 days ending Wednesday Dec. 31, and during the year 1873, compared with the corresponding period of 1872.

WEEK.

	C. & O. C'l. Tons. Cwt.	B. & O. R. R. Tons. Cwt.	Pa. S. Line Tons. Cwt.	Total. Tons. Cwt.
1873	.....	24,194 11	3,589 03	27,783 14
1872	.....	21,196 06	1,919 11	23,115 17
Increase	.....	2,998 05	1,669 12	4,667 17
Decrease	.....	.....	....	

YEAR.

1873	641,830 10	1487239 05	114,589 01	2,243,658 16
1872	612,536 18	1256277 01	21,791 01	1,890,605 00
Increase	29,293 12	230962 04	92,798 00	353,053 16
Decrease	....	....	.....	....

Cumberland Branch R. R.

WEEK.

	To C. & O. Canal. Tons. Cwt.	To P. & O. R. R. Co. Tons. Cwt.	Total. Tons. Cwt.
1873	.....	1,750 16	1,750 16
1872	.....	465 06	465 06
Increase	.....	1,285 10	1,285 10
Decrease		.....	.....

YEAR.

1873	137,581 12	90,158 00	227,739 12
1872	203,617 16	26,534 13	230,152 06
Increase		63,623 07	
Decrease	66,036 04		2,412 17

Report of Coal Transported over the Lehigh Canal

For the week ending Dec. 5, 1873.

REGIONS SHIPPED FROM.	TIDE. tons. ct.	LOCAL. tons. ct.	TL. WEEK tons cwt.	TL. DATE tons. cwt.
Mauch Chunk Region	192 00		192 00	206639 19
Mauch Chunk Region Hazardville				28,845 16
Beaver Meadow Region				131,534 15
Mahanoy Region		197 00	197 00	20,891 01
Hazleton Region		88 00	88 00	199,891 02
Upper Lehigh Region		95 00	95 00	29,967 04
Wyoming Region				114,259 07
Wyoming Region, Hazardville				4,282 09
Total.	192 00	380 00	572 00	736,261 13
Previously reported	260119 12	475560 01	735679 13	
Total to date	260311 12	475940 01	736251 03	
Corresponding week last year	287370 12	479723 12	767094 04	
Increase.				
Decrease	27059 00	3783 11	30,842 11	

DISTRIBUTION.	WEEK 1873.	WEEK 1872.	YEAR. 1873.	YEAR. 1872.
Consumed on line of Lehigh Canal	285 00		81,395 00	80,903 13
Passed into Morris Canal to Tidal Points			2,613 17	5,081 05
Passed into Morris Canal to Local Points			28,233 05	23,519 17
Passed into Del. & Rar. Canal to Tidal Points	192 00	193 03	257,797 15	282,289 07
Passed into Del. & Rar. Canal to Local Points		95 13	13,566 01	14,898 06
Consumed on line Delaware Div. Canal		176 04	39,661 11	47,621 18
Passed through to Bristol	95 00	281 14	312,984 04	312,780 01
	572 00	746 14	736,251 13	767,094 04

Wholesale and Retail Prices of Coal.

At Georgetown, D. C., and Alexandria, Va.

George's Creek and Cumberland f. o. b. $4 60@4 75, wholesale.

Baltimore.

Wholesale Prices to Trade.

Wilkesbarre, by cargoes or cars	$6 25@....
Pittston and Plymouth	6 00@....
Shamokin Red or White Ash	6 00@6 25
*Lykens Valley Red Ash	@6 80
By retail, all kinds per ton of 2,240 lbs	7 50@8 50
*George's Creek and Cumberland f. o. b. at Locust Point for cargoes	4 85@5 00
West Va. Gas Coal	6 50@7 50
Youghiogheny gas f. o. b. at L. Point, nominal	7 50
Kanawha Cannel, coarse	13 00
Tyrone	7 25
Ritchie Mineral of West Virginia	19 00

* Freight to New York $2 15.

Boston, Mass.

George's Creek Cumberland	$5 00
Broad Top	7 50
English Cannel	28 00@30 00

Buffalo, N. Y.

Anthracite	$6 50@7 00
Youghiogheny Gas Coal	6 00
Catfish Lump	4 75
" Nut	3 50
" Nut and Slack	3 00
" Slack	2 85
Connellsville coke	8 00
Beaver Gas Coal	6 50

Chicago, Ill.—Dec. 29.

Sales light and but little increase in the demand.

Anthracite, Wyoming	$10 00
" Lehigh	11 00
Erie and Walnut Hill	8 50
Brooks	8 00
Blossburg	8 50@9 00
Cannel	9 00@9 50
Lick Run, Midway and Hocking Valley	6 50
Indiana Black	7 00
Barclay	6 00
Kirkland grate	8 00
Minonk	5 50
Wilmington	5 00
Youghiogheny	8 00
Pittsburg Coke	10 00
Connellsville Coke	10 50

Cincinnati, O.—Dec. 29.

Fair demand and market steady at the following prices:

Anthracite		$10 50
Youghiogheny, afloat		11 cents per bushel.
" delivered	15@16	" "
Ohio River, afloat	8@ 9	" "
" " delivered	13@14	" "
Kanawha "	15	" "
" Cannel	24	" "
Indiana Cannel	22	" "

Cleveland, O.

Youghiogheny, f. o. b.	$5 25
Walnut Hill	4 50
Steubenville	5 00
Straitsville	4 75
Massillon and Briar Hill Cannel	6 00

Nut coal $1 less.

Louisville, Ky.

Pittsburgh, afloat		per bushel, 15 cents.
" retail		" 20 "
Kentucky		" 17@18 "
Indiana and Peacock Pomroy		" 18 "

Anthracite $10 per ton delivered, and $9 00 afloat.

Memphis—Dec. 29.

Anthracite	$9 00
Pittsburg, afloat	per bushel, 12 cents.
" retail	" 17@18 "
Indiana and Peacock Pomroy	" 16 "
Kentucky	" 12@14 "

Milwaukee—Dec. 27.

Fair demand, prices steady.

Anthracite, Wyoming	$11 00
" Lehigh	12 00
Blossburg	8 50
Pittsburg	8 00
Briar Hill	9 00
Steam coal	6 50@7 50

New York.

	Lump.	Steamer.	Grate.	Egg.	Stove.	Chestnut.
Wyoming Coals.						
Scranton	5 05	5 15	5 25	5 40	5 70	5 05
Lackawanna	5 70	5 80	5 90	6 05	6 35	5 70
Pittston	5 00	5 00	5 10	5 10	5 60	4 90
Wilkesbarre	5 50	5 60	5 70	5 85	6 15	5 50
Newport & Plymouth	....	...	5 80	5 95	6 25	5 65
Susquehanna Coal Co.	5 70	5 80	5 85	6 00	6 30	5 65
Lehigh Coals.						
Old Company	6 30	....	6 15	6 15	6 30	5 50
Sugar Loaf	6 30	....	6 15	6 15	6 30	5 50
Hazleton	6 30	....	6 15	6 15	6 30	5 60
Honey Brook	6 30	....	6 15	6 15	6 30	5 60
Spr'g Mount. Coal Co.	6 30	6 35	6 35	6 35	6 30	5 70
Beaver Meadow	6 50	....	6 35	6 35	6 45	5 70
McNeal	6 30	6 30	6 15	6 15	6 30	5 60
Schuylkill Coals.						
Schuylkill White Ash.	4 60	4 60	4 70	4 70	5 00	3 95
" Red Ash	...	....	4 70	4 85	5 15	3 95
Shamokin W. & R. Ash	....	....	4 80	5 00	5 20	4 10
North Franklin	....	....	5 20	5 20	5 10	4 00
Lorberry	....	....	5 50	5 50	5 50	4 35
Lykens Valley	....	....	....	6 10	6 10	4 75

Philadelphia.

Broken	$5 50
Egg and Stove	5 75
Chestnut	4 75
Pennsylvania and Westmoreland Gas	7 50
Broad Top	5 25
Powelton Sterling	5 25
Derby	5 50

Pittsburgh, Pa.

Connellsville coal	per ton, $2 50
Youghiogheny, at mines	2 00
" at Pittsburgh	2 50
Coke on cars " "	3 25
" " " ovens	2 25
Castle Shannon on Platform	per bushel, 9½ c.

Anthracite, $7 25 on cars.

San Francisco—Dec. 20.

West Hartley, wholesale	$14 50
Australian, "	11 00@12 00

St. Louis, Mo.

Anthracite, delivered	$13 50
Illinois coal, retail	per bushel, 10@14 cts.
" " manufacturers	" 9@13 "
Big Muddy	" 14@18 "
Trenton	" 12½@16 "
O'Fallon	" 10@14 "

In East St. Louis prices are 4 cents less.

Prices of Foreign Coals.

Jan. 1874.

Duty 75 c. per ton.

Corrected weekly by ALFRED PARMELE, No. 32 Pine street, N. Y

Liverpool Gas Caking	16 00@18 00
" " Cannel	13 00@18 00
" House "	20 00@21 00
" Orrel	20 00@— —

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$20 00@22 00
" Cannel, "	23 00@25 00

Per ton 2,000 lbs. delivered.

Prices of Gas Coals.

Jan. 1874.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr., 41-43 Pine st., N. Y

	Coarse	Slack
Block House, f. o. b. at Cow Bay	$2 50	$1 25
Gowrie	2 25	0 00

Corrected by Bird, Perkins & Job, 27 South street.

	Coarse.	Culm of Coal.
Pictou	$3 00	1 50
Sydney	3 25	1 00
Lingan	2 75	1 00
Caledonia	2 75	1 25

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty on all slack coal or Culm: 40c. per ton of 28 bushels, 80 pounds to the bushel. On all bituminous coal or shale: 75 cents per ton of 28 bushels.

The shipments from the Provincial Ports have ceased for the season, and will not be resumed before next Spring. Our quotations, therefore, are merely nominal.

AMERICAN.		Nominal qu. Currency.
Westmoreland	f. o. b.	$8 50@9 00
Fairmount Gas Coal Co. of N. Y.	" Balt.	6 50@7 00
Despard Coal Co	" "	6 50@7 00
Penn	"	8 50@9 00
Newburg Orrel Gas	"	6 50@7 00
West Fairmount Gas Coal	"	6 50@7 00
Redbank Cannel, at Pa	"	12 00@0 00

AT PHILADELPHIA

Westmoreland and Penn	7 50@0 00

TO NEW YORK.

Provincial	
Sydney	
Lingan	$5 00
Cow Bay	4 00
Port Caledonia	4 00
Little Glace Bay	400

TO BOSTON.

Sydney	3 50
Lingan	3 50
Cow Bay	3 50
Port Caledonia	3 50
Little Glace Bay	3 50

TO MONTREAL.

Caledonia	3 75 gold.

TO CUBA.

Caledonia	9 50 gold.

Freights.—Dec. 1873.

TO EASTERN PORTS.	Cumberland. From Georgetown.	Cumberland. From Baltimore	Anthracite. From Elizabethport, Johnston, Weehawken, and Hoboken.	Anthracite. From Phila.	Anthracite. From Rondout.
Amesbury	—	—	—	—	
Bangor	—	—	1 90	3 00	
Bath	—	—	—	—	
Boston	—	2 50	2 10*	2 85	
Bridgeport	—	2 10	90	1 80	
Bristol	—	—	1 30	—	
Charleston	—	—	2 1[illegible]	—	
Chelsea	—	—	2 10	—	
Davenport	—	—	1 10	—	
Derby	—	—	—	—	
Fall River	—	2 15	1 30	—	
Hackensack	—	—	—	—	
Hartford	—	—	1 40	1 80	
Hoboken	—	1 80	50	—	
Jersey City	—	1 80	50	—	
Lynn	—	—	2 10	—	
Middletown	—	—	1 15	—	
Mystic	—	—	1 20	—	
New Bedford	—	2 25	1 50	—	
Newburyport	—	3 25	—	—	
New Haven	—	2 15	90	—	
New London	—	—	1 10	—	
Newport	—	—	—	—	
New York	—	1 80	—	—	
Norwalk	—	—	—	—	
Norwich	—	—	—	—	
Pawtucket	—	—	—	—	
Portland	—	2 50	1 50@2 00	—	
Portsmouth, N. H	—	2 85	2 25	—	
Providence	—	2 25	1 40	—	
Rockport	—	—	—	—	
Saco	—	—	—	—	
Sag Harbor	—	—	—	—	
Salem	—	2 65	2 10	—	
Stamford	—	—	—	—	
Stonington	—	—	—	—	
Taunton	—	—	—	—	
Warren	—	—	—	—	
TO RIVER PORTS					
Albany	—	—	—	—	Canal closed for the Season.
Catskill	—	—	—	—	
Cocksackie	—	—	—	—	
Coeyman's	—	—	—	—	
Cold Spring	—	—	—	—	
Fishkill	—	—	—	—	
Haverstraw	—	—	—	—	
Hudson	—	—	—	—	
New York vessels	—	—	—	—	
Nyack	—	—	—	—	
Poughkeepsie	—	—	—	—	
Rhinebeck	—	—	—	—	
Rondout	—	—	—	—	
Saugerties	—	—	—	—	
Sing Sing	—	—	—	—	
Stuyvesant	—	—	—	—	
Tarrytown	—	—	—	—	
Troy	—	—	—	—	
West Point	—	—	—	—	
Yonkers	—	—	—	—	

† 3 c. per bridge per ton in addition to freight.
† New Haven rate and towing 25 c. extra per ton
‡ Towing from Providence and return, extra,
‖ And Towing.

St. Thomas	$— —	Gold
Martinique	— —	"
Demerara	— —	"
New Orleans	— —	"
Mobile	— —	"

MARKET REVIEW.

NEW YORK, Jan. 8, 1874.

The market for American Pig Iron is rather quiet, as few (if any) makers are offering to sell for future deliveries. They are evidently expecting higher prices than could be got for present delivery. We should quote to-day—No. 1X Fdy Iron at $35½ to 36, and No. 2X $33 to 34 at Hoboken, and Gray Forge at $29 to 30½.

SCOTCH PIG.—Eglinton, $40 to 41; Glengarnock, $42 to 43.

OLD RAILS.—Hardly quotable, though generally held at $43 to 44.

WROUGHT SCRAP.—No. 1 $42½ to 45; from yard.

San Francisco Stock Market.

BY TELEGRAPH.

NEW YORK. Jan. 8, 1874.

We have advices from the San Francisco Stock Board dated the 6th inst.; an advance of $6 per share in Chollor and $7 in Belcher are the only exceptions to a decided decline of the list; the report is as follows:

Savage	—	—	127
Crown Point	—	—	120
Yellow Jacket	—	—	120
Kentuck, "New Issue"	—	—	30
Chollar Potosi	—	—	86
Gould & Curry "New Issue"	—	—	36
Belcher "New Issue"	—	—	117
Imperial	—	—	9
Raymond & Ely	—	—	67
Meadow Valley	—	—	15½
Eureka G. V.	—	—	—
Ophir	—	—	—
Hale and Norcross	—	—	—

American Institute of Mining Engineers.

OFFICIAL BULLETIN.

Announcements to Members and Associates.

I. The ENGINEERING AND MINING JOURNAL, which is the Organ of the Institute, and contains its proceedings, transactions and notices of meetings, will be sent to each Member and Associate on the payment of his annual dues. Back numbers cannot, as a rule, be sent.

II. Dues are payable in advance at the annual (May) meeting. Remittances should be made, as far as possible, by P. O. Order, payable to the Secretary.

THOMAS M. DROWN, Secretary, 1123 Girard street, Philadelphia. Pa.

● HELLER & BRIGHTLY, Engineering and Surveying Instruments, 33 N. Seventh St., Philadelphia.

Without decreasing size of any part of our "Engineers' Transit" we have reduced the weight one-half. An ordinary Transit Telescope magnifies from 10 to 12 diameters, our new Transit Telescope (length 10½ inches, shows objects erect and not inverted) magnifies 28 diameters and will read time on a watch-dial at 283 feet. For description of our new Mining Transit (weight 5½ lbs.) and Plummet Lamp see Van Nostrand's Engineering Magazine, June, 1873.

● Extract from report of Committee of Civ. Engs. appointed by Franklin Inst. to examine H. & B's new Transit: (Dec. 1871.) "It exhibits several novelties of construction which, in the opinion of the committee, render it superior to those now in use, and in its opinion the deviation which they have made from the common styles of Transit are decided improvements."
JOHN C. TRAUTWINE, Chairman.
●

MAYNARD & VAN RENSSELAER,
Mining and Metallurgical Engineers,
Experts in Iron, Analytical Chemists,
24 Cliff Street, New York.
GEO. W. MANNARD, SCHUYLER VAN RENSSELAER.

THOMAS M. DROWN,
ANALYTICAL CHEMIST
AND
CONSULTING METALLURGIST
1123 GIRARD STREET,
PHILADELPHIA.

WOOD ENGRAVING
EXECUTED AT THE OFFICE OF
The Engineering and Mining Journal
27 PARK PLACE, NEW YORK CITY.

THE ENGINEERING AND MINING JOURNAL.

ROSSITER W. RAYMOND, Ph. D. }
JOHN A. CHURCH, E. M. } Editors.
RICHARD P. ROTHWELL, C. E.
Editor of the Coal and Iron Department.

PUBLISHERS' ANNOUNCEMENT.

THE ENGINEERING AND MINING JOURNAL *is projected in the intent of furthering the best interests of the Engineering and Mining public, by giving wide circulation to original special contributions from the pens of the ablest men in the professions. The careful illustration of new machinery and engineering structures, together with a summary of mining news and market reports, will form a prominent feature of the publication.* It is the Organ of the American Institute of Mining Engineers, and is regularly received and read *by all the members and associates* of that large and powerful society, *the only one of the kind in this country.* It is therefore the best medium for advertising all kinds of machinery, tools and materials used by Engineers or their employees.

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THE SCIENTIFIC PUBLISHING COMPANY.

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ALL communications on subjects connected with coal and iron are cordially solicited; they should be addressed to RICHARD P. ROTHWELL, under whose direction that department of the Journal is conducted.

MESSRS. W. P. BLAKE, HAMILTON HILL, and THATCHER, members of the committee of the Vienna International Patent Convention, have issued a call for a meeting in Washington, on the 15th instant, to organize an association in this country, in the interest of an international patent code. We trust the meeting will be successful, and that the association to be formed will represent fairly the spirit of American legislation, which is the only spirit that we care to see made the basis of an international code. Mr. HAMILTON HILL, in particular, must disavow the doctrine which he weakly assisted to incorporate into the Vienna platform—namely, that the inventor should be compelled by law to permit all suitable applicants to use his invention under royalty, if the public good requires it. We don't interfere with private property that way, on the plea of "public good," in this country; and Mr. HILL's pusillanimous surrender of an American principle at Vienna needs to be repented of. The Washington meeting will give him an excellent opportunity to return to the true faith.

Jigs.

IN another column, Mr. ENGELMANN replies to the criticisms of a correspondent upon the UTSCH jig, and the claims put forward in behalf of the CAZIN jig. This branch of the discussion is not without real, though subordinate, importance. In our opinion, Mr. ENGELMANN is quite right in demanding that the CAZIN jig shall be compared with machines designed to do the same kind of work—namely, the Harz jigs with several plungers. There is no question that the machine is good in every other respect than that which gives it its special name and character—namely, the employment of a single plunger. There is question, and a chance for fair debate, on that point. Mr. ENGELMANN's objection that a long plunger is clumsy and will vibrate, does not trouble us much. We reply with ARTEMUS WARD, "Let her vibrate; that's her biz." The vibration of a lever with fulcrum at one end and force at the other, under the circumstances of this case, will not hurt anything. But the objection, that the single plunger fixes the proportion of stroke and speed among the sieves beyond any adjustment except that which affects them all, is a very serious one. We are strongly inclined to believe that a Harz jig, with independent plungers, set alongside of the one-plunger jig, and running on the same material, could be finally so adjusted as to stroke, rate, supply and discharge of each compartment, that it would do better work. At all events, it could be set so as to do exactly the same work—and the way would still be open for an important class of experiments which the one-plunger system would not permit. To offset this disadvantage, Mr. CAZIN's machine doubtless presents simplicity of gearing and economy of power, and therefore a diminished cost of erection and maintenance. It is for every engineer to calculate for himself, under his own local conditions, which way the balance of advantage varies. We not only do not pretend to decide the matter on general grounds for every case, we distinctly declare that it is impossible to so decide it. We do not believe any one type of machine is the best under all circumstances. We have no more sympathy with panaceas in mining than in medicine. Our position is that of the wise man, who, being asked by a country correspondent what was "the best way to cure cornstalks," replied, "That depends upon what ails your cornstalks."

Discrimination against Foreigners.

THE present mining law of the United States is in most respects so good that we have hesitated to press the necessity of amendments to it, fearing lest the final result of a reopening of the case might give us something worse, instead of better. Our views upon the "tunnel-clause," however, have been clearly expressed; and we feel constrained to call attention to one other feature of the law, which is productive of inconvenience and damage, while it does not secure the apparent advantages at which it was possibly aimed. We refer to the provision which prevents any foreigner or foreign corporation from obtaining a patent to mining ground.

A perfect title has become, after much bitter experience, a *sine qua non* with foreign, and particularly with English, investors in American mines. These people have learned also, in the same painful way, that a mining title is not perfect without a United States patent. Hitherto, in the great majority of instances, foreign capital has been tempted by dazzling estimates of profit to run large risks of loss and litigation. That style of business was naturally incidental to a new country and an infant industry. Now, the visions of excessive profits fade, but the risks remain fearfully real and tangible; and if we truly desire the aid of capital in legitimate undertakings, it is for us to see that capital is not enticed, but protected.

We see some good reason for confining to American citizens the right of holding mines by possessory titles. The public lands belong to the people; and they should not be given away, whether for agricultural or for mining purposes, to those who are not citizens. But when a citizen has sold his possessory title to a *bona-fide* foreign purchaser, why should not the latter be allowed to enjoy the rights which the former meant to convey?

Moreover, even if it were desirable to prohibit the acquisition of mines by alien corporations, the end is not secured by the present law. It is necessary only for a citizen to take out the patent; and then nobody can prevent the legal transfer of title. But many a poor miner cannot incur the expense of procuring a patent before attempting to get aid by loan or sale; and many a foreigner, perplexed or disgusted by the round-about formalities required, will refuse to obtain a title by what seems to be a subterfuge, and to involve additional perils of irregularity. A foreign corporation already operating American mines cannot be expected to go through the farce of selling its property to an American citizen, that he may get a patent for it, and sell it back again. Such a course would be attended with legal difficulties at every step.

The net result of our law in this respect is, therefore, that some foreign capitalists are deterred by its unmeaning provisions from investing at all in American mines, while others continue to work the mines they hold, and the United States is deprived of the money they would gladly pay for their patents, if they were allowed to make direct application.

We do not think this state of things was deliberately contemplated by Congress; and we trust that the objectionable features of the law will be so changed as to simplify and complete the protection which everybody is willing to extend to legitimate investments of capital in our mining industry. For the benefit of our European readers, we will add that these remarks do not refer to titles in the older states, but only to the mines (principally of gold, silver and lead) opened upon the public domain in the far West.

Foreign Nations and the Centennial Exhibition.

THE Executive Committee of the United States Centennial Exhibition has received a very interesting report from Professor W. P. BLAKE, its special agent to Vienna. We condense from his statement the following important facts.

The Centennial Exhibition is looked forward to by all classes in Europe with increasing interest as the first international exhibition in America under government sanction and patronage. It is regarded everywhere, since the proclamation of the President, last July, as a national enterprise, to which the United States are fully committed. Professor BLAKE's labors during the Exposition at Vienna greatly contributed to the sentiments of sympathy and co-operation felt by foreign nations and governments. The Emperor of Austria, the principal ministers of that empire, and the distinguished men of all countries gathered at the various

Congresses in Vienna, as well as diplomatic representatives of European and Asiatic governments, were fully informed concerning our plans.

Professor BLAKE reports that anxiety has been manifested and suggestions have been made by foreign exhibitors with regard to several points which they consider essential pre-requisites to their full co-operation. He names among these the following :

First. Protection of their property and protection of the interests of exhibitors. To this end the organization of a responsible body to act as agent of foreign exhibitors to receive, place, describe, guard and to dispose of, or return, articles sent, and further to give information concerning them to jurors or others.

Second. A well-devised system of awards, a judicious selection of jurors and effective organization of the jury.

Third. Facilities for transportation and protection from needless expenses of moving, unpacking, placing and removing goods.

Fourth. Favorable and simple customs regulations.

Fifth. Permission to trade under proper restrictions.

Sixth. Facilities for advertising.

Seventh. Early publication of a good catalogue assured.

Eighth. Provision for descriptive reports and publication of the results of the exhibition.

Professor BLAKE announces several valuable donations from foreign countries toward the collections of the permanent museum. The Swedish Commissioner has presented a valuable series of iron ore of Sweden and Norway, which cost $10,000. The Norwegian Commission has presented a fine massive block of yellow copper ore, weighing two tons. The Vienna brick manufacturers and builders, and also the celebrated Rennberg brick and tile works, near Berlin, have presented very valuable collections of bricks, tiles and mouldings. From Austria a fine series of specimens of spiegeleisen, ferro-manganese, bauxite, etc., is promised. From Hungary a box of samples of the peculiar "earth wax" or ozokerite, mined near Pesth, has been received. China and Japan will undoubtedly contribute to the exhibition ; and several wealthy Turkish merchants have offered to erect a complete Turkish village, containing a grand bazar, coffee house, bathing establishments, etc., if they can be allowed the privilege of trading.

Printing Chromo-lithographs by Steam.

THE art of chromolithography has made great progress of late years, though the most recent improvements have been such as affect rather the ease and rapidity of manufacture than the quality of the product. We refer particularly to the printing of chromolithographs by steam, which permits the issue of editions far greater than were possible under the tedious method of hand-printing. The home of this art is France, where it has been brought to a high degree of excellence, after costly experiments, by such artist manufacturers as MONROCQ, who, step by step, has perfected his machinery and trained his workmen, until now he has attained a brilliancy of color and an accuracy of technical manipulation which challenge admiration, while they almost defy imitation, in other countries.

The text for these remarks lies before us, in a new book, published by J. B. FORD & Co. of this city, and sold by their agents throughout the United States. It is a series of short essays by Mrs. STOWE, called *Woman in Sacred History*. Of the subject-matter we have nothing to say here ; the columns of a technical journal are scarcely the place for purely literary—still less for biblical or historical—criticism. It is as a specimen of a wonderful manufacture that it has attracted our attention. It is illustrated with sixteen full-page chromo-lithographs, after paintings by RAPHAEL, BATONI, DELAROCHE, HORACE VERNET, GOODALL, LANDELLE, KOEHLER, PORTAELS, DEVEREUX, VERNET, LECOMTE, BAADER, MERLE and BOULANGER, printed by MONROCQ, of PARIS, from stones executed by the celebrated JEHENNE.

Messrs. FORD & Co. were the first to introduce steam-printed chromolithographs on a large scale into this country. The pictures they have distributed, to the number of several hundred thousand, as premiums to the subscribers of the *Christian Union*, have been of this character. The worst fault to be found with them has been, so far as our observation goes, a variability of quality which was noticeable in the earlier of their vast editions. With the advancing perfection of the new processes, this has gradually disappeared ; and the latest premium chromos of this house appear to be remarkably uniform and true in tone, and precise in "registry."

But the illustrations of the volume before us are as far beyond the French "premium chromos," and "oleographs" of the same publishers as those were beyond the wretched American steam-prints that constitute the commencement in this country of what may yet become artistically respectable. Each of these illustrations is printed upon sixteen stones ; and a simple calculation shows that in the preparation of the first edition of 15,000 copies, no less than 3,840,000 separate impressions were necessary. By the assistance of the steam-press, this work was accomplished in a few weeks. The transparency, lustre and richness of the tints, and the nicety with which they have been adjusted and superposed, are marvellous examples of the application of machinery to the most delicate manipulations. The subjects have been well chosen, with respect to the work of the artist as well as that of the author. If we have spoken of them somewhat coldly from the standpoint of the mechanic, it has not been without a strong temptation to speak enthusiastically of the noble simplicity, grace and power of the masterpieces of art which are here reproduced for the enjoyment and profit of the American public.

NEW PUBLICATIONS.

DIE NUTZBAREN MINERALIEN UND GEBIRGSARTEN IM DEUTSCHEN REICHE, *nebst einer physiographischen und geognostischen Uebersicht des Gebietes.* Von DR. H. VON DECHEN, Wirklichem Geh. Rath und Oberberghauptmann a. D. Berlin, 1873.

This volume, containing, as its title indicates, a treatise on the useful minerals and rocks of the German Empire, together with a physiographic and geological description of the territory to which it refers, is one of the most important publications of the year in Germany. It is a master's masterpiece. The eminence of the author, who is one of the highest authorities on this subject, and who, throughout a long life of successful scientific and technical labor, has been acquiring that intimate familiarity with a vast array of facts, which now finds expression in comprehensive form, is a sufficient guaranty of the trustworthy, suggestive and practical character of the work. It is modestly called by the author a revised and enlarged version of his contributions to VIEBAHN'S *Statistics of North Germany and the Customs Union*, published more than ten years ago ; but the manner in which it has been brought down to recent date, and extended to cover the whole of the new Empire, no less than its publication as a separate volume, entitles it to be considered a fresh, complete and independent work. Knowing as we do the estimation in which VON DECHEN is held by German geologists, we are not surprised to find that a considerable number of the most distinguished and active of them have freely assisted him in the preparation of this treatise.

The first part is devoted to the superficial topography of Germany, which is considered first in its orographic, and secondly in its hydrographic aspects. Under the former head we find a masterly description of the mountain systems of Germany. This empire occupies a portion of the middle European zone which stretches from the Atlantic coast to the foot of the Ural, and is bounded on the south by the Pyrenees, Alps and Carpathians, and on the north by the Scandinavian ranges. The political boundaries of Germany do not follow the leading features of surface upheaval so closely as to permit a discussion of its topography without allusion to that of neighboring countries. Thus the Netherland range, extending through Belgium to the Scheld, is a part of the system of Westphalia. The relation between the Black Forest and the Vosges, as borders of the Rhine basin from Basle to Mayence, is evident ; and its effects extend into Suabia on one side and Lorraine on the other. The high Alps, indeed, do not belong to Germany ; but the southern part of Bavaria extends into their northern auxiliary chains. On the east, we find in Bohemia, Moravia and Austrian Silesia the true center of the Sudetic and Hercynian system, which extends westward to the Netherlands. Finally, the great northern lowlands of Germany reach westward without interruption into the Netherlands and Belgium, while they are continuous in their middle course with the northern part of the Cymbrian peninsula and its connected islands, and stretch eastward over the boundaries of Germany far into Russia and Poland, finally widening into the immeasurable plains that find their limit in the Ural mountains.

This great complex of peaks, highlands, hills, plains and valleys, is clearly described by our author, who divides it into four principal systems of upheaval, namely, the Westphalian, the Rhenish, the Hercynian and the Alpine, devoting also to the North German lowlands a separate chapter.

The hydrographic description of the empire is equally systematic and thorough. This region is tributary to three seas, the North, the Black and the Baltic, the basins drained into these seas having the following approximate areas : into the Baltic 211,419 sq. kilom. ; into the North Sea 292,125 sq. kilom. ; into the Black Sea (the Danube basin) 57,524 sq. kilom. The principal river systems are those of the Rhine, Weser, Elbe, Oder, Weichsel, and Danube. These with all their tributaries are described, so far as they pass through German territory. Only one of them belongs wholly to Germany, namely the Weser, which drains no foreign soil. The Danube is chiefly Austrian ; but a considerable portion of it traverses East Bavaria.

The next division of this work treats of the geological structure of Germany, giving first a general survey of the subject, and then discussing in succession the crystalline schists and the sedimentary formations, with due consideration under each head of the locally associated eruptive rocks. As might be expected from the author of the best geological map of Germany yet published, this description is masterly in plan and detail. The sedimentary rocks are taken up in chronological order, commencing with the Silurian. The Cambrian, or Huronian, and the Laurentian formations are but lightly alluded to, as being only scantily represented in Germany. Of the latter group, Councillor VON DECHEN says it can scarcely be recognized as Palaeozoic, but belongs rather to the Eozoic crystalline schists, the fossils found in it being, in his opinion, of "highly doubtful character."

Under the head of peat-moors we find an interesting summary of the occurrences of peat in the German Empire. From the borders of Holland through the whole North German lowlands are found deposits of this substance, furnishing a fuel of variable quality but enormous quantity. In the South German Post-Pliocene basin, from Lake Constance to the Danube at Passau, peat-moors are also frequent. In the Rhine basin they occur at several places, as also, here and there, where local conditions are favorable, throughout Germany. They are accompanied, in numerous instances, by deposits of bog iron ore, to the accumulation of which the processes of peat formation are auxiliary.

Among alluvial deposits, the sands of a number of German rivers are known to be more or less auriferous. This is the case with the Rhine, Moselle, Eder,

Diemel, Inn, Isar, Elbe, etc., from all of which gold has been obtained in times past, though probably never on a large scale, and at present not at all.

The next, and to us the most important, department of the work treats of the useful minerals and rocks; and we cannot do better than to adopt substantially the introductory remarks of the author himself, by way of indicating the scope and arrangement of his discussion of the subject. For the purpose of arriving at a comprehensive view, the different minerals and rocks are considered in order. The combustible minerals are placed first, on account of their importance, and are treated in the order of their geological age, as coals, lignites and peat. The coals are arranged according to age, beginning with the oldest, and the basins are taken up in the same order as that followed in the previous geological description, so that the occurrences of coal in the Netherland or Westphalian system come first and those of the Rhenish, Hercynian and Alpine systems follow. The chapter closes with an interesting account of the sources of asphaltum, bitumen and mineral oil. The manufacture of the latter substance from bituminous schists and lignites, although greatly checked and limited by the enormous importations of petroleum from the United States, is still an important industry in Germany—more so, indeed, than in any other country.

Following the mineral fuels, the most important ores are considered successively on a similar plan, combining a chronological with a territorial subdivision. The resources of Germany in iron, lead, zinc, and copper ores are thus displayed in a complete and well-proportioned picture. The minor ores are treated, with less fullness, in a similar manner, after which a systematic account of the rock-salt deposits, salines and mineral springs of the empire is given.

As Councillor VON DECHEN well observes, the importance of many stones, rocks, and earths employed in the arts exceeds that of most metallic ores, and entitles them to rank with the fossil fuels and with iron. In their distribution, however, many of these materials are far more general than those substances usually classed among mineral deposits. The variety of useful rocks and earths is so great and their special applications are so numerous, that a simple classification of them is difficult. The extensive occurrence of many varieties hinders such an enumeration of localities as can be given for metallic ores; and in some cases all that can be done to indicate the resources of any region in a particular kind of useful rock, is to include the whole area of the geological formation which that rock constitutes.

Those varieties which are employed in agriculture as fertilizers, such as lime, gypsum and phosphorite, are of the greatest importance; and their quantity is so enormous that a statement of the annual amount of product, and of capital involved in their industrial application, would be surprising. For such a statement complete data are wanting.

Probably most important of all are the rocks which are employed either directly as building stones, roofing materials, pavements, floors or road metal, or indirectly in the preparation of bricks, mortar and cement. They exert the greatest influence upon social conditions, such as construction of dwellings, the execution of public buildings and monuments, and the establishment of the most necessary means of communication. Their use and value vary widely, according to their occurrence, whether in great abundance and wide distribution, so that they can be obtained everywhere in the neighborhood of the localities where they are required, or in scanty quantity and only at single points, from which must be supplied large areas where not even a substitute can be found. The quarries in the Muschelkalk at Rüdersdorf, a few miles from Berlin, furnish a striking example of the importance given by isolated position to rocks which in other regions are used on a very small scale only.

The materials of ornaments and sculpture, though less important to mankind than the ordinary material of architecture, exert, nevertheless, an influence upon the development of art, the human sense of beauty, and so the exaltation of architecture itself. These materials constitute a long series, from the substances out of which small ornaments and household utensils are formed, to those which are employed as precious stones, including minerals of the most diverse character—even amber, which is a fossil resin. On the other hand, many rocks are directly used in the arts, such as those which furnish mill-stones, whet-stones, slates and slate-pencils, lithographic stones and the infusorial earth employed both as polishing powder and as an ingredient of dynamite.

The material for the preparation of fire-proof building-stones and vessels is of the first importance for many arts, particularly for the metallurgy of iron, steel, zinc and other metals, for the manufacture of glass, and for the operations of chemical technology. This class includes very different substances, such as clay and graphite, the latter of which finds an additional extensive application in the manufacture of lead pencils. Closely related are the materials of pottery and porcelain manufacture. The field of technology includes also a vast variety of materials employed partly as dyes and pigments, partly for chemical preparations, and partly as metallurgical fluxes.

Of this wide field Councillor VON DECHEN does not undertake to give a complete review, but furnishes numerous notes and hints, which many serve to indicate how great is the importance of a thorough investigation and discussion, based upon such a collection of data as will enable statisticians to determine what proportion these useful minerals bear to the total wealth annually obtained from the mineral treasures of the earth and devoted to the benefit of man.

The final subdivision of the book contains statistical accounts of the production of mines, furnaces and salines in Germany for the year 1872, together with comparative statements referring to former years. The summary of these statistics is given as follows:—

Products.	1850. Value in Thalers.	1850. No. of Workmen.	1860. Value in Thalers.	1860. No. of Workmen.	1870. Value in Thalers.	1870. No. of Workmen.
Combustible minerals..	11,488,689	47,302	30,787,289	102,089	61,863,399	145,782
Ores	5,948,654	44,126	10,773,587	59,683	19,621,024	73,427
Furnace products.....	16,136,020	20,124	36 197 063	29,083	59,221,850	31,153
Manuf'd furnace prod'ts	24,778,118	27,841	49,087,321	43,225	104,211,610	80,364
Products of salines.....	5,619,070	6,729	6,070,314	5,916	3,926,650	4,614
Total workmen..... ..		146,122		239,996		335,340
Wives and families.....		275,002		451,672		631,110
Total.....		421,124		791,668		966,450

It would be useless to add up the single sums in order to obtain totals of money value from this table, since the products of each class are to a greater or less extent included in the values attached to other classes. Our author complains of the deficiency in statistical material, particularly as regards peat, and also with respect to clay, marl, loam, paving-stones, road-metal, products of quarries, etc. The latter materials are therefore omitted in this summary.

The volume contains 806 octavo pages, is printed very clearly in Latin type, and is provided with a table of contents so elaborate as, perhaps, to justify the absence of an alphabetical and analytical index. It is to be regretted that the publication of the book in Berlin, while the author resided in Bonn, has left a chance for typographical errors, of which the printers seem to have availed themselves to an extraordinary extent. The fault is partially atoned for by a table of corrections at the end of the book.

THE POPULAR SCIENCE MONTHLY for January, 1874, maintains its well-earned reputation as a medium of information at once entertaining and profitable, and of discussions at once fearless, fair and temperate. The personal views and sympathies of Professor YOUMANS, the editor, are well known; but they do not prevent him from giving place in the *Monthly* to the ablest arguments of all parties. Judge STALLO's powerful papers, striking at the root of many established physical conceptions, too often regarded as axiomatic, or even absolute, by modern reasoners, have been leading features of recent numbers. The present instalment, dealing with Inertia and Force, is not inferior in clearness and profundity to its predecessors. Professor MAXWELL's address on the "Theory of Molecules" is another fine specimen of reasoning—like a pure stream, the transparency of which makes us almost fail to realize its depth. The editor's own discussion of the position occupied by JOHN STUART MILL, with reference to scientific education is one of the keenest and most suggestive things in this number. HERBERT SPENCER's "Replies to Criticisms" are, for several reasons, less interesting than what we have been getting from him in this magazine. The subjects are dry and abstruse, and the criticisms replied to are either unfair or unanswerable—by which latter term we mean to describe the sort of criticism which proceeds from diversity of standpoints, and leads therefore to irreconcilable antagonisms. Whether Mr. SPENCER has or has not understood KANT, for instance, couldn't be determined even if KANT were alive, and will certainly be an insoluble conundrum now. Besides, the answer would have little value, if we got it. No founder of a philosophic school is profitably employed in the criticism of other schools. His work should be constructive, not defensive or aggressive. If it is symmetric and strong, it will be its own defence; and if not, it will tumble down, like a child's block-house, when he puts on the last piece. These dialectic distractions are for Spencerians, but not for SPENCER. Nevertheless, everything he writes is worth reading; and we reckon his article among the attractions of a remarkably good number of the *Popular Science Monthly*.

MR. LAWRENCE S. BENSON turns up again (appropriately enough, in a circular) with his celebrated Geometry, in which EUCLID is overthrown, and the circle squared, by the simple device of rejecting the *reductio ad absurdum*, and postulating two kinds of truth, one square and one circular. The *reductio* is not necessary in Mr. BENSON's case—which may be the reason why he discards it. As for his two kinds of truth, we prefer the square variety, and have for the other a label that distinguishes it very clearly. We presume there is something not quite square in the way Mr. BENSON continues to quote the commendation of President WEBSTER, Professor DOCHARTY and Mr. RANDALL, without giving the dates when they endorsed him and his circular views. To their names is now added that of "President HUNTER, of the Normal College of the City of New York," who has "practically" (we suppose circularly) endorsed Mr. BENSON's views, and also that of Professor CHARLES DAVIES, LL.D., whose alleged recent repudiation of the *reductio ad absurdum* is similarly interpreted as a kind of roundabout support. We are not inclined to reopen our ancient controversy with Mr. BENSON and his $3R^2$. If he would be consistent, and say "three R *round*," we might even agree with him, in a sort of transcendental rotary sense. Nor is it any longer important that Messrs. WEBSTER, DOCHARTY and RANDALL should disavow their hasty approval of his fantasies. But Professor J. G. FOX, formerly of the Cooper Union, and now of Lafayette College, is advertised by Mr. BENSON, in a quotation from the *Scientific American*, as commending his Geometry; and it is quite in order for the *Scientific American* and Professor FOX to rise and explain. If it is true that by such endorsements, and the help of some obscurer *savans* of Georgia, Tennessee and South Carolina, the book is acquiring considerable circulation in Southern schools, we may look in a few years for a fearful crop of Bensonians, whose inclination to regard plane topics in revolutionary ways will be a nuisance.